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Department of Telecommunications and Energy
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Person Responsible: Mark Lively

Attachment NSTAR-JS-1-6(b)

Letter from Mr. Lively dated 2004 March 23 to Mr. Steve Terelmes of AmerenEnergy

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2004 March 23

Mr. Steve Terelmes
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Dear Steve:

I appreciate the opportunity to work with you on the North American Energy Standards Board (NAESB) Inadvertent Interchange Payback Task Force (IIPTF) over the last seven months. Following the February IIPTF meeting in Houston, I reached the conclusion that IIPTF charter granted by the NAESB Wholesale Electric Quadrant (WEQ) Executive Committee (EC) is too restrictive to permit the IIPTF to develop a functional market for unscheduled flows of electricity. Accordingly, I decline to participate in the meetings of the IIPTF until the WEQ EC acts to change that charter.

In fairness to you, to the IIPTF, to NAESB, and to the WEQ EC, I feel I must explain the logic that led me to the conclusion that the current IIPTF charter from the WEQ EC prevents the development of a workable market. I believe that the appropriate market is for unscheduled flows of electricity, not just for Inadvertent Interchange. Inadvertent Interchange is too restrictive in that the North American Electric Reliability Council (NERC) definition of Inadvertent Interchange

- Is for a clock hour, preventing a market participant to capture the shortage value which often occurs for only a few minutes, not for a full hour.
- Is versus the rest of the grid, preventing utilities from obtaining benefit for providing transmission paths for high value parallel path flows and other forms of loop flow.[1]
- Is for active power, preventing payment for reactive power, which was a significant factor in the 2003 August 14 blackout.

Accordingly, this letter details that logic. I am sending a copy of this letter to Rae McQuade of NAESB and Lou Oberski and Tony Reed of the NAESB WEQ EC.

DEFINING INADVERTENT INTERCHANGE

The value of electricity can be classified primarily as commodity related and shortage related. Shortages of electricity typically last for a few minutes. Indeed, NERC has a standard that shortages shall be eliminated within ten minutes. The California shortage debacle, which lasted months, was an anomaly.

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[1] I note that defining Inadvertent Interchange versus the rest of the grid also complicates the verification of the calculation of Inadvertent Interchange.

Because electricity nominally cannot be stored, the value of any shortage is while it is happening. Also because electricity nominally cannot be stored, there can be "negative shortages" which negatively influence the price. Negative shortages are merely surpluses, but I find it more appropriate to refer to surpluses as negative shortages because the need to respond to surpluses can be as critical as the need to respond to shortages.

NERC defines Inadvertent Interchange as the net unscheduled flow of electricity out of a control area (generally a utility or a group of utilities) **during an hour**. If the net flow is into a utility for an hour, that utility's Inadvertent Interchange is defined to be negative. With Inadvertent Interchange being defined for a clock hour and most shortages lasting less than ten minutes, there is a mismatch between when value accumulates (during the two or three minutes associated with most shortages) and when revenue would attach (during the clock hour associated with Inadvertent Interchange.) A shortage might generate a million dollars of value over three minutes. But any entity delivering Inadvertent Interchange any time during that hour, even if not at all during the three minutes of the shortage, would share in that million dollar prize.

Accordingly, I believe that the IIPTF will not be able to develop a functional market for unscheduled flows of electricity until the WEQ EC allows the IIPTF to deal with measurement periods that are substantially shorter than the hour period associated with Inadvertent Interchange as defined by NERC.

LOCATIONAL PRICING

NERC created a Joint Inadvertent Interchange Task Force that created principles for evaluating Inadvertent Interchange. One of those principles was that the value of Inadvertent Interchange varied with location.

The value of electricity can change slowly with location, such as with marginal electrical losses. The value can also change abruptly, such as when there is transmission congestion. Downstream of the congestion there is a shortage and high prices. Upstream of the congestion there is a negative shortage and depressed prices. Sometimes the congestion occurs **in the middle of a utility**.

Electricity often enters the utility on one side and effectively leaves on the other side, creating what is known as loop flow. Generally, loop flow has a minimal value. However, when transmission congestion occurs in the middle of a utility, loop flow has great value, since the electricity entering the utility on one side has a greatly different value from the electricity leaving the utility on the other side.

Inadvertent Interchange is the net of all unscheduled flows into and out of a utility. Loop flow does not change the amount of Inadvertent Interchange of a utility. If a utility's Inadvertent Interchange is zero, there is no price for Inadvertent Interchange that can provide compensation to the utility for loop flow, or for parallel path flow, a specific form of loop flow. Accordingly, pricing Inadvertent Interchange prevents market participants from capturing the value associated

with the use of their transmission grid. Instead, there should be separate prices for each of the interconnection points that a utility has with its neighbors.

As a side point, NERC has agreed to provide the amount of Inadvertent Interchange for purposes of the IIPTF. However, one NERC expert participating in the IIPTF expressed doubts about NERC's ability to fulfill this promise, pointing out that NERC has been unsuccessful in auditing Inadvertent Interchange for any hour in over a year. I believe that a substantial part of the problem is that Inadvertent Interchange is defined as the net unscheduled flow that a utility has with **the rest of the grid**.

The amount of electricity scheduled into one utility from a second utility is the amount of electricity that the second utility has scheduled to deliver to the first utility. Similarly, the amount of electricity metered into one utility from a second utility is the amount of electricity that is metered out of the second utility and into the first utility. The difference between these scheduled and metered amounts can be called an unscheduled flow of electricity.

When the unscheduled flows of electricity are summed across all of the interconnections in the grid, the net total must be zero, since every metered-in is matched by a metered-out and every scheduled-out is matched by a scheduled-in. Since Inadvertent Interchange is but clock hour accumulations of unscheduled flows of electricity for a control area, Inadvertent Interchange for the entire grid should also sum to a net of zero. But NERC has not been able to get the sum of the reported Inadvertent Interchange to net to zero for over a year, even when NERC relaxes its standard to summing Inadvertent Interchange for all of the on-peak hours of a day or all of the off-peak hours of a night.

Because Inadvertent Interchange is defined for a control area versus the rest of the grid, there is no bilateral verification of metered and scheduled amounts. Often two utilities will record different meter readings for the lines between them because they have no financial reason to verify their meter readings with each other. Pricing unscheduled flows on each interconnection between utilities would provide a financial reason to verify meter readings.[2]

Dealing with unscheduled interchange on a bilateral basis solves the problem of verifying Inadvertent Interchange amounts.[3] If two utilities must settle bilaterally between them, the two utilities will have incentives to reach an agreement as to the unscheduled interchange between them. They will have procedures in place to verify meter readings.

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[2] A settlement of Inadvertent Interchange with the rest of the grid would also require the creation of a settlement fund. The settlement obligation would be with the settlement fund not between control areas. I understand that the Federal Reserve System accepts the settlement obligation on behalf of its member banks for purposes of clearing the funds, at least until a check bounces. Then the individual bank has the obligation.

[3] Dealing with unscheduled interchange on a bilateral basis also obviates the need for a settlement fund

REACTIVE POWER

NERC defines Inadvertent Interchange as the active (real) power flow out of a control area. Since our electric network is an alternating current system, some of the power flow on a system is reactive power, calculated as kvar (kilovolt-ampere-reactive.) The associated energy is calculated as rkvah (reactive-kilovolt-ampere-hour.) Reactive power is necessary to create the electromagnetic field associated with motors and with the operation of transmission lines.

Reactive power occurs when the 60 Hertz change in the current leads or lags the 60 Hertz change in the voltage, resulting in leading or lagging power. A phenomenon associated with reactive power is that reactive power will change the local voltage. Leading power will help raise the voltage. Lagging power will tend to lower the voltage. A problem during the 2003 August 14 blackout was the low voltage in Northeast Ohio. At least one utility, FirstEnergy, commented on the poor reactive power performance by others as aggravating the power shortage and contributing to the causes of the blackout.

Pricing unscheduled flows of reactive power in the minutes and hours prior to the blackout would have allowed participants to capture significant market value, reducing the likelihood of the blackout. This market value cannot be available under the WEC EC charge for IIPTF to develop a market for NERC's definition of Inadvertent Interchange.

CONCLUSION

NERC's definition of Inadvertent Interchange prevents participants in the potential market for unscheduled flows of electricity from capturing the value associated with their participation. NERC's definition is deficient because it is for a full clock hour, it does not permit a utility to obtain value for providing parallel paths to scheduled transactions, and it does not provide value for reactive power. Further, the definition of Inadvertent Interchange as being with the grid destroys the incentives for utilities to verify meter values with their neighbors.

I would be glad to talk with the NERC WEC EC about problems with its charge to the IIPTF, but believe my further participation in IIPTF would be futile at this point. Please share this letter with the WEC EC and the IIPTF.

Yours truly,

/s/

Mark B. Lively
Utility Economic Engineers

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